PROSCAN

IN-LINE PROCESS SENSOR

Operation & Installation Manual

Rev. 2

AW GEAR METERS

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Safety Definitions and Information

Do not attempt to install or use your AW Gear Meters product until you have read the safety instructions in this section. Save this manual and keep it in an easily accessible place.

Warning!

Warning means that failure to follow this safety statement may result in extensive product damage, serious personal injury, or death.

Caution

Caution means that failure to follow this safety statement may result in minor or moderate personal injury, property or equipment damage.

Notice

Notice is a statement that informs about installation, operation, maintenance, performance issues, or general tips which are important but do not create a hazard or safety concern.

Unpacking

1. Separate the ProScan™ device from packaging materials and check for any visual signs of damage. If you determine there has been damage caused by shipping, file a claim with the shipping company. If the sensor appears to have been improperly assembled or does not operate properly, return it for replacement or repair (see Limited Warranty information at the end of this manual).
2. Carefully remove all items from the shipping package and compare the contents to those listed on the shipping documents. If there is a discrepancy, contact the manufacturer.

Caution

Before connecting or using the ProScan sensor, read this manual.

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Quick Setup Guide

Caution

As with any precision-engineered device, always use the ProScan In-Line Process Sensor in accordance with the manufacturer's instructions.

Choose Location

The best location to install the ProScan sensor is to a tee or saddle in the process line.

Install Electrical Connection

Attach the five-pin electrical cable to the sensor and tighten the threaded cord grip (see Figure 1, page 8).

Position Sensor

Install the sensor vertically in the process line, preferably with the electrical connection facing the floor (see Figure 2, page 14).

Connect

Connect the opposite end of the electrical cable to PLC, DCS, or data logger (see Figure 1, page 8).

Notice

In the following manual, you will find complete connection, operating, set-up, and maintenance instructions.

Product Description

ProScan is an in-line optical sensor that mounts directly to the process line, providing real-time information about the process.

ProScan can accurately detect the point of transition from water to product, which is the primary application. Depending on the degree of solids difference between two materials, it can also detect a product–to-product transition. And for products such as skim, 1 percent, 2 percent and whole milk, ProScan can act as a monitor of milkfat percentage and an indicator of product quality.

The most common calibration entered into ProScan includes points for water, skim milk, 1 percent milk, 2 percent milk, whole milk and a maximum response standard equal to 20 mA.

The 3A Certified ProScan also has uses in the brewing, pharmaceutical, and juice processing industries. The device accurately monitors turbidity and product concentration and can help processors recover as much product as possible before a cleaning cycle begins. It can also help to ensure equipment adds costly chemicals at the appropriate time.

The ProScan sensor assists in determining if fluid should be added to recovery tanks or sent to the drain, and is an excellent monitor of BOD loading on waste lines. Solid construction means the ProScan Sensor stands up to the high temperatures and temperature fluctuations.

Principle of Operation

Utilizing advanced optical technology, ProScan sends a beam of light into the process and measures the backscatter, which is proportional to solids concentration. The device's internal microprocessor then converts the scatter to a linearized 4-20 mA output, which easily links to a PLC, DCS or data logger.

Features

- 3A Certification
- Real-time process control
- Detects phase transitions
- Stainless steel construction
- Sapphire lens

- Sanitary clamp connections
- NEMA 6 /IP67 enclosure
- Easy to install, set up and maintain

Technical Specifications

Mechanical

- Materials: 316-series stainless steel housing and fittings; sapphire and FDA-approved silicone product contact surface
- Dimensions: 3.0" diameter x 3.6" length (approx.)
- Weight: 4 lbs. (approx.)
- Ratings: NEMA 4X (water-tight, corrosion proof); authorized to carry 3-A symbol (Standard 46-03)
- Optical Lens: uncoated, optical sapphire (aluminum oxide) min. thickness = 2.3mm
- Lens Seal: 60 durometer, FDA-approved silicone rubber (meets ZZR-765-E, Class 2 A&B)
- Lens Surface Finish: 0.1 microns/inch £

Performance/Electrical

- Accuracy: +/-0.2% of span at 4.00 mA (water)
- Repeatability: +/-1.0% of span in any target fluid
- Process Temp Range: 32° to 250°F (continuous)
- Ambient Temp Range: 40° to 120°F
- Process Temp Shock: withstands instantaneous changes of up to 125°F (e.g. From 40° to 165°F during CIP, or from 125° to 250°F during SIP)
- Temperature Effect: 0.9% of span/10 deg F change (process and/or ambient) maximum
- Process Temperature Limits: vacuum to 200 psig at rated temperature
- Output: 4-20 mA, 3 or 4 wire
- Power: 15-28 VDC, at 35 mA
- Connection: 5 pin, water-tight, with quick-disconnect cabling

Preliminaries

Standard Shipments

Unless specified otherwise, ProScan sensors are shipped with a standard calibration covering a span of 4 to 20 mA and representing clean water at 4 mA and a maximum white standard at 20 mA. A calibration document is included in the shipment to inform you of the calibration date and details.

Unpack and Check Contents

Upon receipt of the shipment, carefully remove all items from the shipping package and compare the contents to the shipping documents.

Also check:

- The ProScan sensor and other components for any damage that may have occurred during shipping.
- To make sure the sapphire lens is clean and undamaged. (If the lens needs to be cleaned, clean it gently with a mild soap solution and a soft, clean cloth.)
- The sensor's electrical connector; it should easily mate with the connector pins on the sensor body.
- To make sure the threaded collar allows a snug, secure fit when fully engaged.

Electrical Connections

ProScan has a 5-pin electrical connector. The electrical connection scheme is shown in Figure 9, page 20. If you purchased the molded, NEMA-6 electrical connector and cable from AW Gear Meters, simply connect the cable as provided.

If you are using the Hirschmann connector (Part Number 932 878-100 ELST 512 PG9 (www.hirschmann-usa.com) and need to make a cable connection, please read the following steps.

The most common wiring scheme for ProScan is a 3-wire connection:

- Pin 2 is the mA output
- Pin 3 is the 12 to 24 VDC power supply
- Pin 4 is the ground (negative side of the supply).

A 4-wire connection can also be used to connect ProScan. In this wiring scheme, connect

- Pin 1 (the negative side of the mA output)
- Pin 2 (positive side of the mA output)
- Pin 3 (12 to 24 VDC power supply)
- Pin 4 (ground).

Pin 1 is the negative side of the mA output and is connected internally to Pin 4. This makes it more convenient if you want to make a 4-wire connection as shown in Figure 1, page 8.

Notice

Pin 5, located in the center of the connector, is not used.

Once you make the connections inside the electrical connector, tighten the threaded cord grip on the connector. This helps keep moisture from entering.

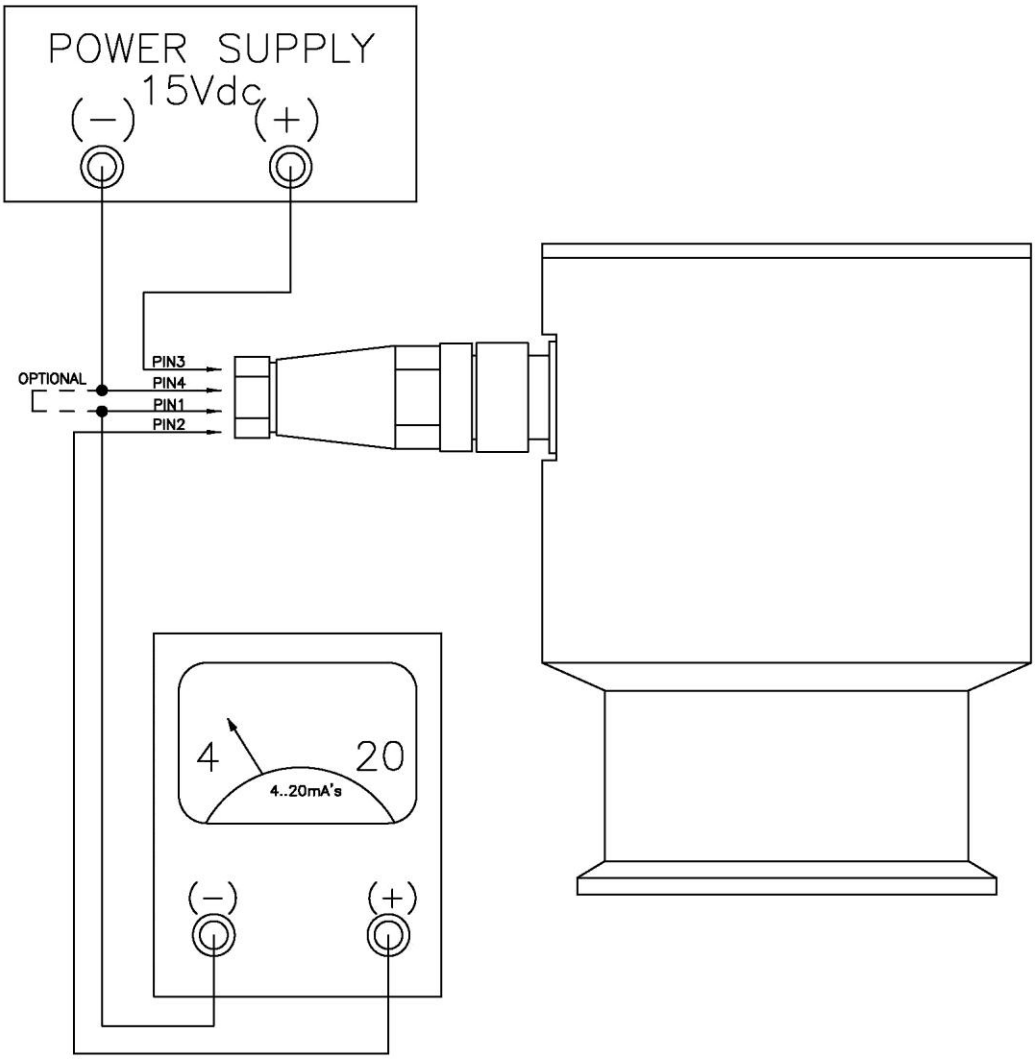


Figure 1: Electrical connections

Operation

Once ProScan is calibrated and you make the proper electrical connections, the sensor is ready for operation. Before attaching the sensor to the process line, however, it is advisable to perform a quick check of the unit's operation.

Notice

You must connect the sensor output to a digital display, multimeter or some other electronics that allows you to monitor the ProScan's mA output.

Applying Power

To view the unit's internal electronics board, remove the screw cap on the sensor (see Figure 3, page 15). When you apply power to the ProScan sensor, the green LED on the unit's internal electronics board blinks.

Notice

When the sensor is operating within the current calibration range, the Green LED on the sensor's electronics board blinks alone. When over-range, the Red and Green LEDs blink, and when below range, the Green and Yellow LEDs blink.

Test Output

1. Place a white paper towel on a table.
2. With the lens facing down, place the sensor on the towel. This should produce an output of approximately 17 mA. The actual output may range from 16 to 19 mA; this is normal.
3. Lift the sensor straight up, approximately 2 inches above the towel. This should yield a signal of 4 to 4.5 mA.
4. Slowly lower the sensor back to the towel; the mA output will increase as the sensor gets closer to the towel, eventually reaching approximately 17 mA.

If the sensor performs as stated in the previous test, it is ready for installation. If not, call AW Gear Meters for technical assistance.

Installation

ProScan has a conventional sanitary clamp connector that attaches directly to a tee or saddle in the process line or vessel. ProScan comes in standard 1.5, 2, 2.5 and 3 inch sizes.

You can install ProScan in a wide variety of configurations, including vertical and horizontal process lines and tanks. To optimize the performance of the sensor, it is important to:

- keep the deadleg as short as possible on the tee connection, and
- choose an installation site that minimizes air or sediment from collecting on the sensor's lens.

Deadleg

To minimize deadleg, cut the tee back so the ProScan lens is as close as possible to the process stream. In most cases, it is possible to cut the tee back and have a resulting deadleg of 1 to 2 inches. The shorter the deadleg, the better.

Installation Site

Select an installation site and orientation that minimizes the possibility of air or sediment interfering with the sensor's readings.

Vertical

Vertical sections of process lines are excellent installation sites, whether the flow is down or up.

Horizontal

Another excellent installation site is a 90-degree elbow on a horizontal line. In this case, position the ProScan device so the fluid flows directly at the sensor's lens.

Straight Sections

If installed on a straight section of horizontal process line, place ProScan so it looks sideways into the process stream, not up or down.

Installations Not Recommended

Two installations not recommended are:

- on the top of horizontal process lines, where air has a tendency to accumulate, and
- on the bottom of horizontal process lines, where sediment can accumulate.

Clamp Connection Gasket

The clamp connection requires a gasket between ProScan and the tee. In most cases, the customer provides the gasket and the tee. Customers can purchase these products from AW Gear Meters, if necessary.

Connect

Connect the sensor to the process pipe with the appropriate sanitary gasket and clamp. Orient the sensor so that the electrical connector points toward the floor (see Figure 2, page 14).

Caution

The sapphire lens can be damaged if struck by sharp or hard objects or if the sensor is dropped during installation. Take care when connecting the sensor to the tee so the lens isn't damaged.

Calibration Verification or Test with Your Samples

The factory normally calibrates ProScan according to customer specifications and in most cases, the factory calibration is sufficient for the application. However, if you want to verify the calibration or determine the sensor's response on your samples, follow the steps below and record the ProScan response.

Notice

A common setup is to close off the bottom leg of the tee with an end cap, attach ProScan to the middle leg, and pour the sample in the top leg.

1. Obtain samples of all products that this system will process. You will need enough of each to fill a tee as shown in Figure 6, page 18.
2. Connect ProScan to the required power supply. Attach the sensor to a suitable test stand, such as a sanitary tee (shown on page 14).
3. Be sure to wire the ProScan device properly to either the receiver or to a Multi-meter so you can view the corresponding signal output from the unit. When you supply power to the ProScan, the green LED on the electronics board blinks.

Caution

Be careful not to dilute or otherwise contaminate the samples between readings. Also, if the highest degree of accuracy is desired, make sure the samples are at the same temperature as they will be in the process line.

4. Starting with the product containing the least amount of solids of lowest turbidity, fill the tee as shown.
5. Record the output for this product, then move to the next, ending with the product containing the greatest amount of solids.

Notice

When the sensor is operating within the current calibration range, the Green LED on the sensor's electronics board blinks alone. When over-range, the Red and Green LEDs blink, and when below range, the Green and Yellow LEDs blink.

The resulting profile corresponds to the outputs from the unit at each of the various products. Use these values as the reference for programming a receiver or to verify calibration of the ProScan sensor. Changes in product properties (solids content) are a common cause for discrepancy. If observed, follow the Calibration Procedure below.

Calibration Procedure

If you want to adjust the calibration, follow this procedure:

1. Obtain samples of all products that will be processed in this system. If using liquid sample, you need sufficient volume of each to fill the tee. Calibrate them in increasing order of concentration. ProScan allows you to choose a variety of calibrations, from a 2-point calibration to a 9-point calibration.
2. Be sure you wire the unit to either the receiver or to a Multi-meter so you are able to view the corresponding signal output from the unit.
3. Remove the ProScan lid by turning it counterclockwise.
4. Remove the screw cap on sensor and turn the lid counterclockwise. This allows access to the electronics board. Refer to Figure 3 on page 15 to locate the Calibration Switch, Entry Key and Offset Adjustment Keys.

Caution

Be careful not to damage the rubber o-ring.

5. As shown in Figure 6 on page 14, fill the tee with clean water, or another fluid that you desire to be the 4 mA reference (if a value other than 4 mA is desired for the base value, please see SENSOR OFFSET and SPAN CALIBRATION section below).
6. Observe the mA reading that ProScan produces with the 4 mA reference sample. If the output is 4 mA, there is no need to adjust. If you desire to change the zero point, turn the calibration switch to position "0", and press and hold the ENTRY key for approximately two seconds. This stores the new value as 4mA.
7. Remove the water, or optional base product, and fill the tee with the next highest solids content.

Notice

So as not to introduce error in calibration, it is recommended you rinse the tee with water to clean any residue of the previous product from the face of the sensor.

8. Turn the CALIBRATION SWITCH to position 1. Press and hold the ENTRY key for approximately two seconds. The sensor output is now set to 20.00 mA (or the span setting).
9. Repeat step 8, incrementing the CALIBRATION SWITCH by one, until you have calibrated all points (maximum is to point 8). As you add points, each addition becomes the new 20.00 mA top end. Each previously entered point is linearly re-scaled.
10. In general, a five (5) point calibration is sufficient to provide proper output resolution. You may use calibration point 0 to 8. Point 9 is reserved for the Sensor Output Reference, described below.
11. To obtain output values, place the sensor again into each of the test liquids. With each product, record the resulting current output from the transmitter. The resulting profile corresponds to the outputs from the unit at each of the various products.
12. You can now can use these values to program a receiver.

Sensor Offset and Span Calibration

The ProScan sensor is typically prepared at the factory with a default value of 4.00 mA output for the "base reference" position "0," and 20.00 mA for span position "9." For most applications, it is recommended that the unit be used in this configuration. The following procedure illustrates steps to verify or modify these values.

1. Remove the screw cap on sensor.

Caution

Be careful not to damage rubber o-ring.

1. Refer to the Figure 3 on page 15 to locate the Calibration Switch, Entry Key and Offset Adjustment Keys.
2. If you wish to change the span value, place the Calibration switch in Position "9" and press the "up" or "down" offset adjustment keys until you obtain the desired value; then press and hold the ENRTY key for approximately 2 seconds.
3. If you wish to change the "base reference" value, place the Calibration switch in Position "0" and press the "up" or "down" keys until you obtain the desired value; then press and hold the ENTRY key for approximately 2 seconds.

This following illustrates how you can tailor the ProScan calibration to meet different process control needs.

Figure 4 on page 16 shows an example of a multi-point calibration. For this example, milk samples were used. Water = 4 mA, skim milk = 8 mA, 1% milk = 12 mA, 2% milk = 16 mA and whole milk = 20 mA. The calibration selector switch was 0 position for water, 1 position for skim milk, 2 position for 1% milk, 3 position for 2% milk and 4 position for whole milk.

Figure 5 on page 17 shows a slightly different example of a multi-point calibration. In this case, a dairy customer wanted a greater degree of sensitivity near 1% milkfat; a 6-point calibration was used, which emphasized the 1% to 1.3% milkfat concentration. All that was necessary was to prepare samples of the proper concentration. The ProScan calibration linearizer divided the 4 to 20 mA span into five sections of 3.2 mA each, including the key range in the middle of the graph.

If questions arise at any time, please call AW Gear Meters at (262) 884-9800.

Figure 2: ProScan Sensor attached to a sanitary T, electrical connection facing floor

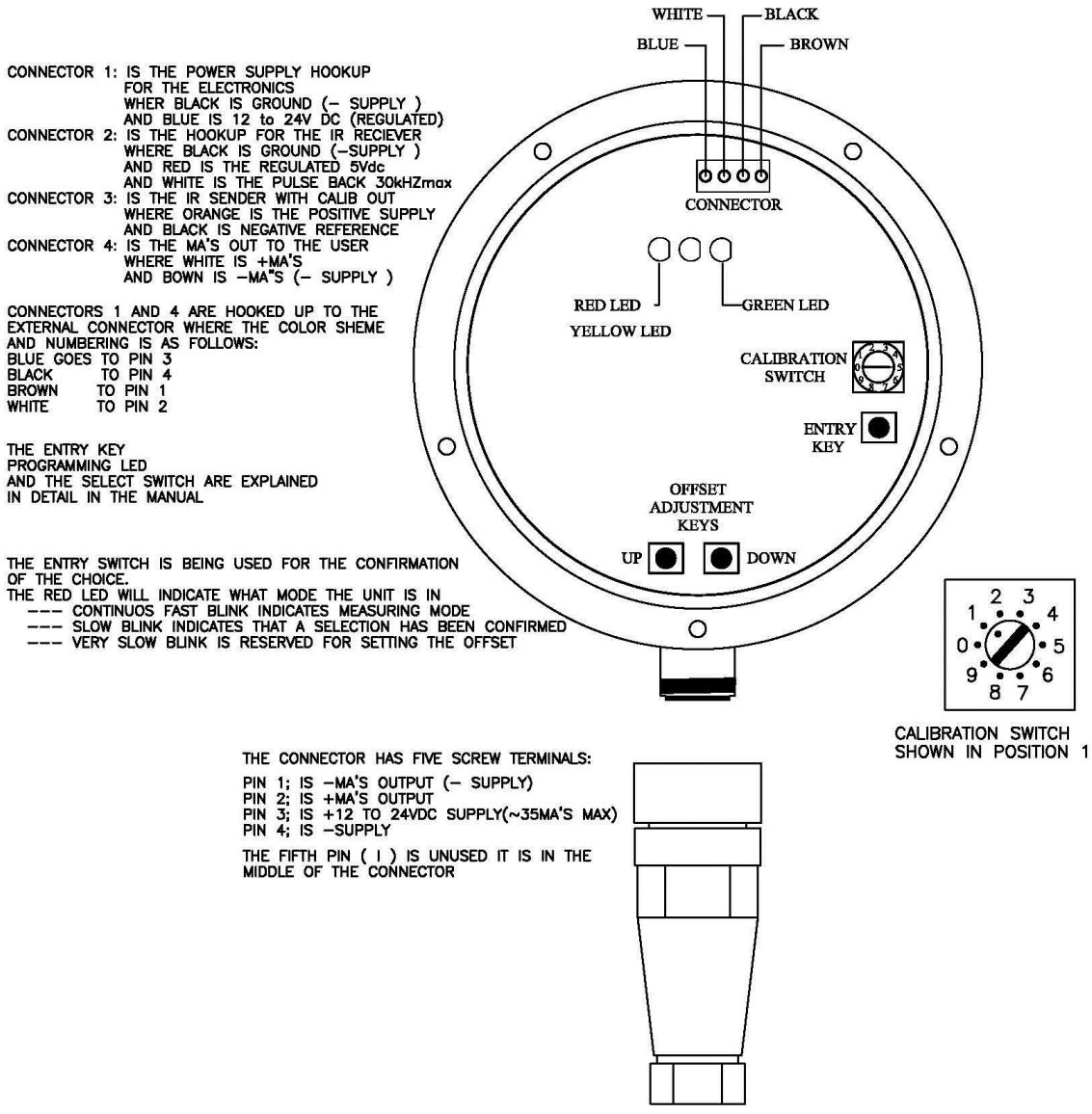

CONNECTOR 1: IS THE POWER SUPPLY HOOKUP
FOR THE ELECTRONICS
WHER BLACK IS GROUND (– SUPPLY)
AND BLUE IS 12 to 24V DC (REGULATED)
CONNECTOR 2: IS THE HOOKUP FOR THE IR RECIEVER
WHERE BLACK IS GROUND (–SUPPLY)
AND RED IS THE REGULATED 5Vdc
AND WHITE IS THE PULSE BACK 30kHZmax
CONNECTOR 3: IS THE IR SENDER WITH CALIB OUT
WHERE ORANGE IS THE POSITIVE SUPPLY
AND BLACK IS NEGATIVE REFERENCE
CONNECTOR 4: IS THE MA'S OUT TO THE USER
WHERE WHITE IS +MA'S
AND BOWN IS –MA"S (– SUPPLY)
CONNECTORS 1 AND 4 ARE HOOKED UP TO THE
EXTERNAL CONNECTOR WHERE THE COLOR SHEME
AND NUMBERING IS AS FOLLOWS:
BLUE GOES TO PIN 3
BLACK TO PIN 4
BROWN TO PIN 1
WHITE TO PIN 2
THE ENTRY KEY
PROGRAMMING LED
AND THE SELECT SWITCH ARE EXPLAINED
IN DETAIL IN THE MANUAL
THE ENTRY SWITCH IS BEING USED FOR THE CONFIRMATION
OF THE CHOICE.
THE RED LED WILL INDICATE WHAT MODE THE UNIT IS IN
--- CONTINUOS FAST BLINK INDICATES MEASURING MODE
--- SLOW BLINK INDICATES THAT A SELECTION HAS BEEN CONFIRMED
--- VERY SLOW BLINK IS RESERVED FOR SETTING THE OFFSET
WHITE
BLACK
BLUE
BROWN
CONNECTOR
RED LED
GREEN LED
YELLOW LED
CALIBRATION SWITCH
ENTRY KEY
OFFSET ADJUSTMENT KEYS
UP
DOWN
1 2 3 4 5 6 7 8 9 0
CALIBRATION SWITCH SHOWN IN POSITION 1
THE CONNECTOR HAS FIVE SCREW TERMINALS:
PIN 1; IS –MA'S OUTPUT (– SUPPLY)
PIN 2; IS +MA'S OUTPUT
PIN 3; IS +12 TO 24VDC SUPPLY(~35MA'S MAX)
PIN 4; IS –SUPPLY
THE FIFTH PIN (I) IS UNUSED IT IS IN THE
MIDDLE OF THE CONNECTOR

Figure 3: Back of sensor showing LEDs, connector, calibration switch, entry key, adjustment keys, etc.

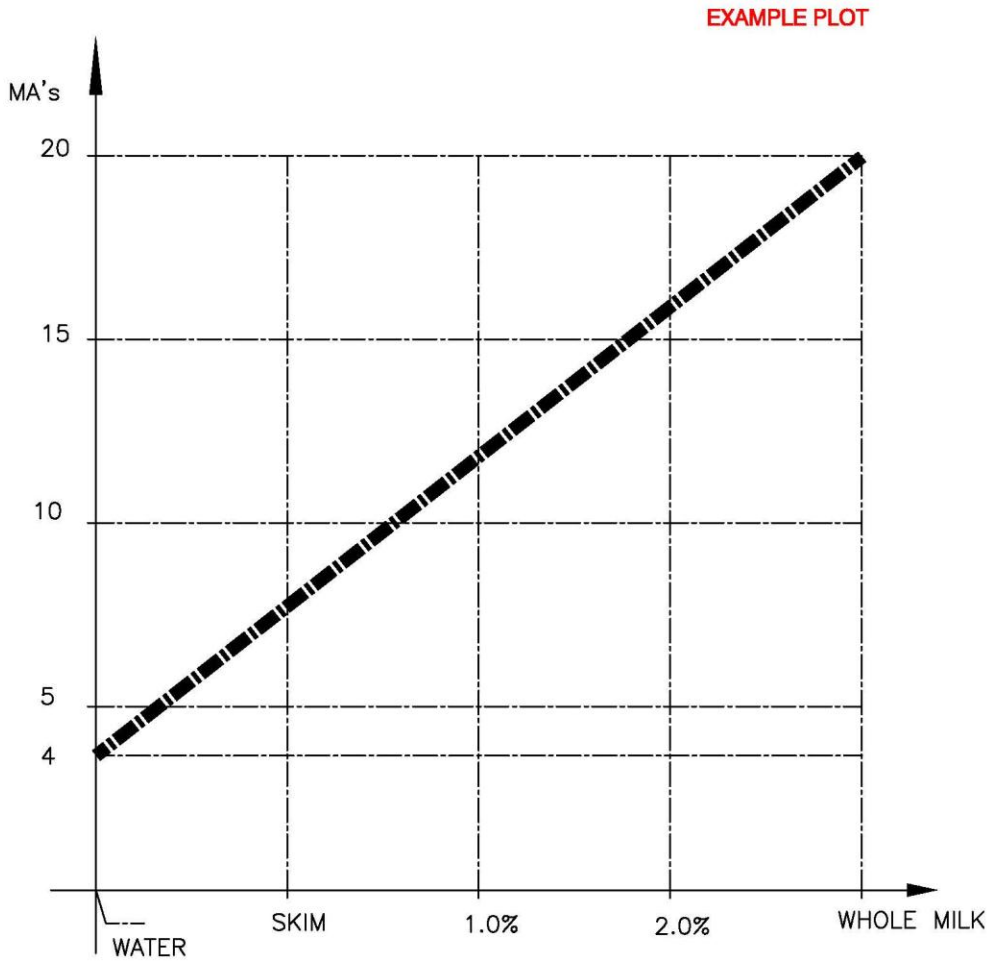


Figure 4: Calibration lineariser, 4 point

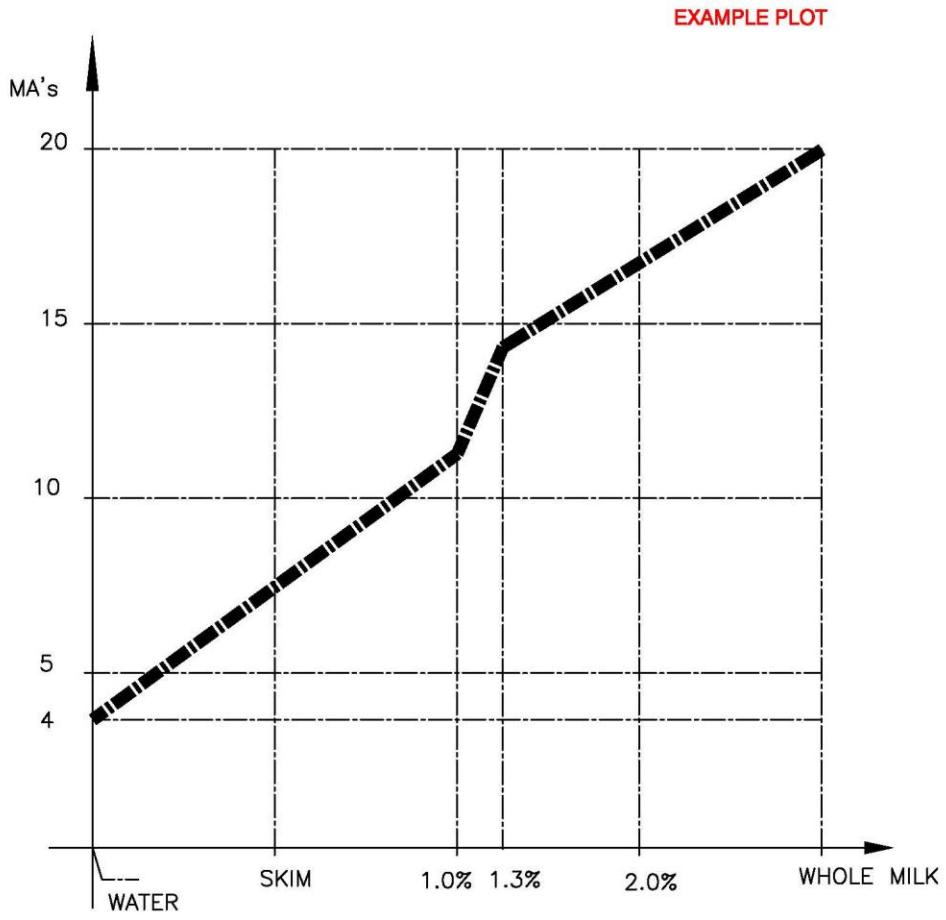


Figure 5: Calibration lineariser, 5 point

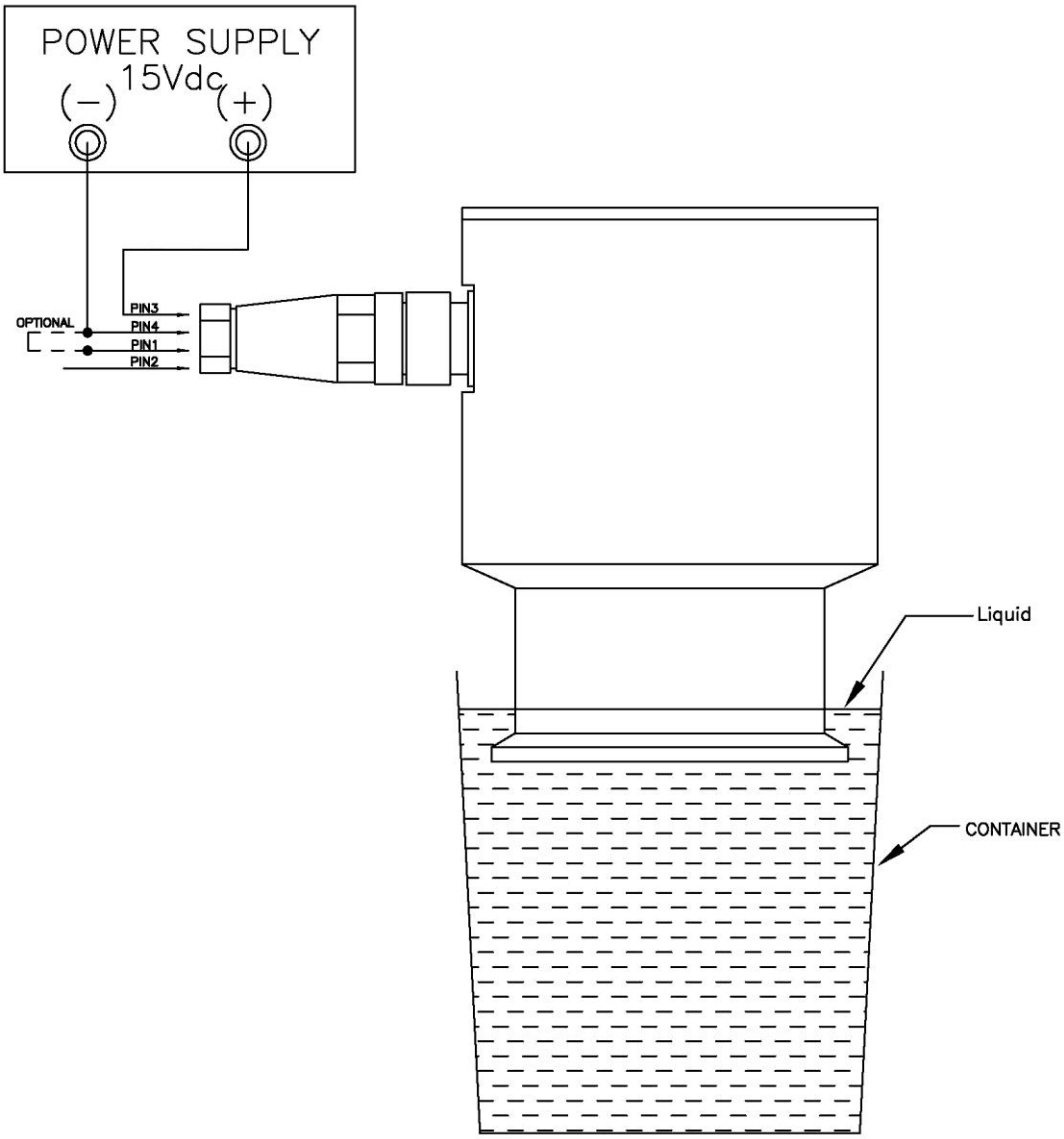


Figure 6: Recalibration

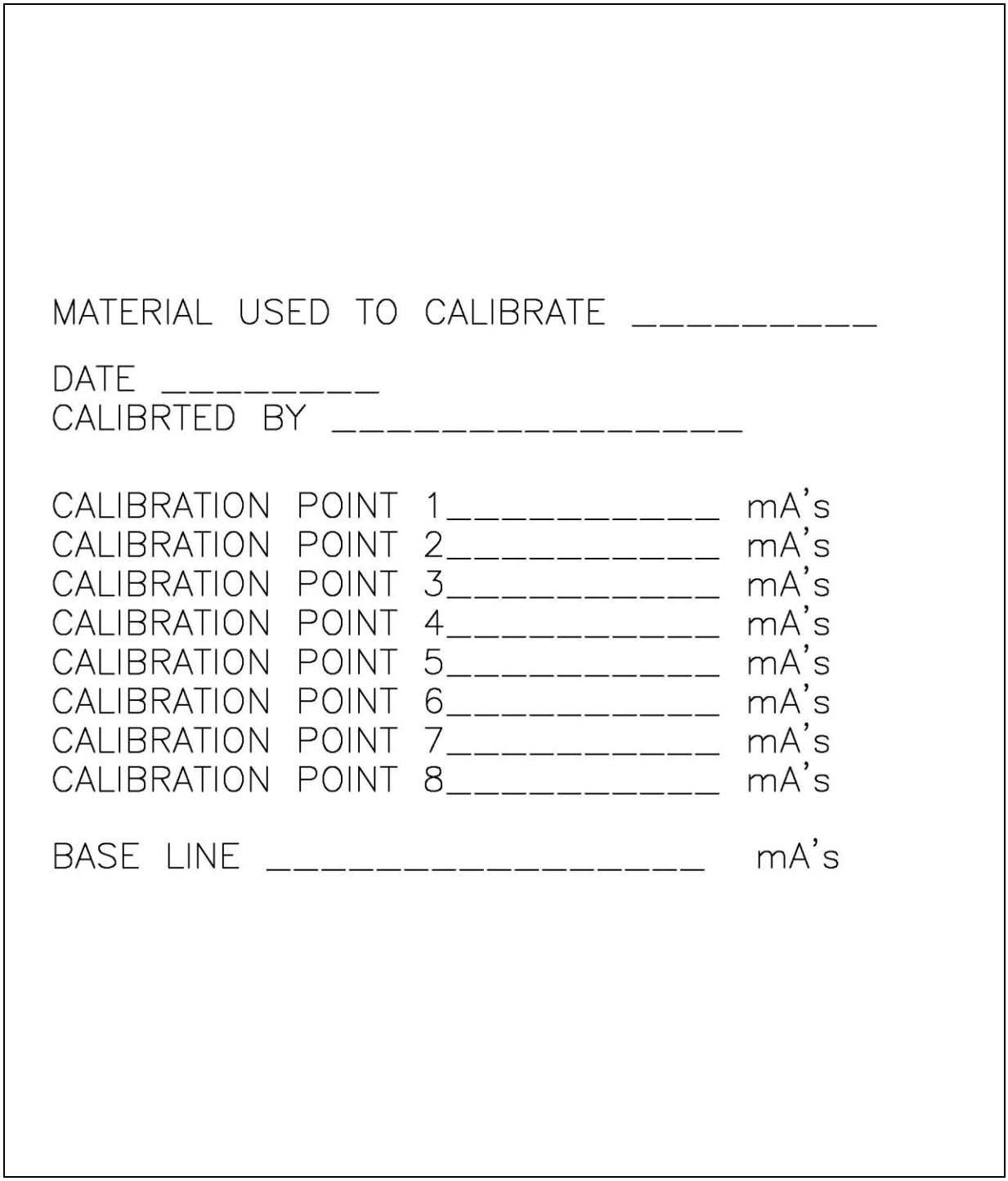
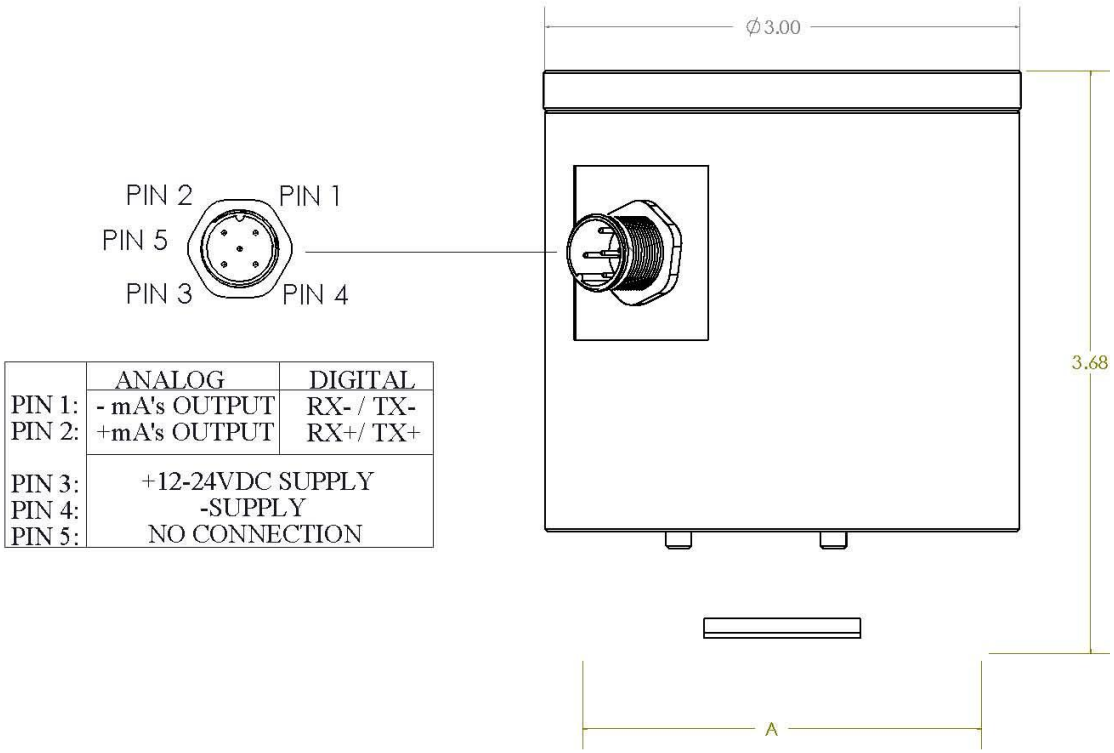


Figure 7: Factory calibration information

PROSCAN

MODEL #	"A"	HOUSING	LENS	GASKET	WEIGHT
1.50" PROSCAN	1.984"	316 SS	SAPPHIRE	FDA SILICONE	TBD
2.00" PROSCAN	2.516"	"	"	"	3LB
2.50" PROSCAN	3.047"	"	"	"	TBD
3.00" PROSCAN	3.579"	"	"	"	TBD

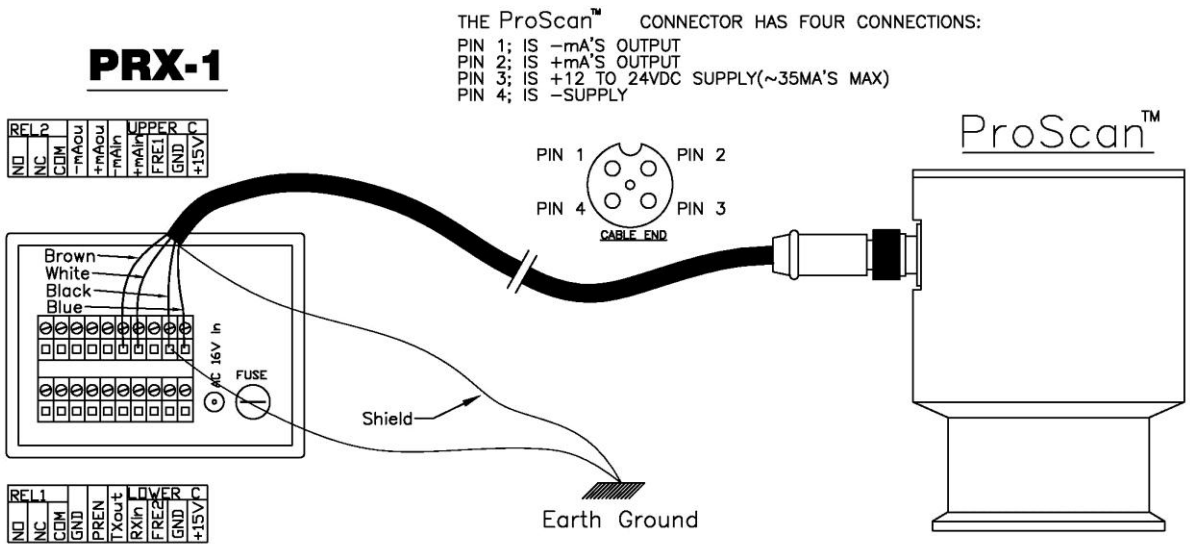


	ANALOG	DIGITAL
PIN 1:	- mA's OUTPUT	RX- / TX-
PIN 2:	+mA's OUTPUT	RX+/ TX+
PIN 3:	+12-24VDC SUPPLY	
PIN 4:	-SUPPLY	
PIN 5:	NO CONNECTION	

NOTE:

ALL PROSCAN MODELS HAVE OPTION FOR EITHER ANALOG (DEFAULT) OR DIGITAL OUTPUT. REGISTERED WITH 3-A SANITARY STANDARDS.

Figure 8: Five-pin connector with digital and analog output options



IMPORTANT: It is vitally important to use shielded electrical wire and to properly ground the shield wire and the PRX−1 to an Earth ground as shown in the diagram.

Figure 9: ProScan and PRX-1 wiring

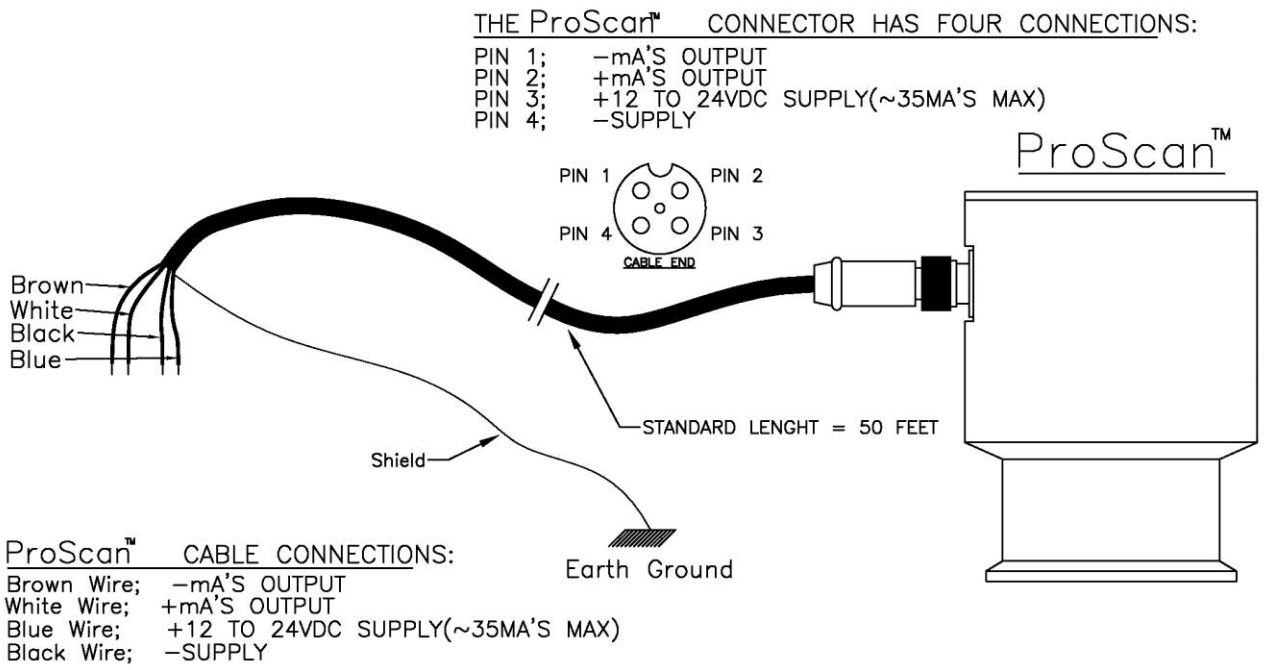


Figure 10: ProScan Wiring

Disclaimer

AW Gear Meters has reviewed this manual thoroughly so it is easy to use. All statements, technical information and recommendations in the manual or related documents are believed to be reliable, but the accuracy and completeness thereof is not guaranteed or warranted. Also the information in this manual is subject to change without notice. All schematics and details are the product of AW Gear Meters. No reproduction, alteration or disclosure of this material or any other proprietary product detail, outside the intended user, or any third part, is allowed without prior written consent from AW Gear Meters, Franksville, Wisconsin. In no event will AW Gear Meters be liable to the customer for any damages, including any lost profits, lost savings or inability to use such product, even if AW Gear Meters has been advised of the possibility of such damages, or for any claim by any other party.

Limited Warranty

AW Gear Meters warrants the product to be in good working order for a period of 1 (one) year from the date of purchase from **AW Gear Meters** or an Authorized **AW Gear Meters** distributor. Should the product fail to be good working order at any time during this 1-year warranty period, **AW Gear Meters** will, at its option, repair or replace the product at no additional charge except as set forth below. Repair parts and replacement products will be furnished on an exchange basis and will be reconditioned or new. All replaced parts and products become the property of **AW GEAR METER**. This limited warranty does not include service to repair damage to the product resulting from accident, disaster, abuse, or a **non AW GEAR METERS** modification to the product.

Limited Warranty service may be obtained by delivering the product during the 1-year warranty period to AW GEAR METERS- and provide proof of purchase date. If this product is delivered by mail, you agree to insure the product or assume the risk of loss or damage in transit, to prepay shipping charges to warranty location and use the original shipping container or equivalent.

For further information contact:

AW Gear Meters
8809 Industrial Drive
Franksville, WI 53126
Phone: (262) 884-9800
Fax: (262) 884-9810

ALL EXPRESS AND IMPLIED WARRANTIES FOR THIS PRODUCT INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO A PERIOD OF 1 (ONE) YEAR FROM DATE OF PURCHASE, AND NO WARRANTIES, WHETHER EXPRESS OR IMPLIED, WILL APPLY AFTER THIS PERIOD. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

IF THIS PRODUCT IS NOT IN GOOD WORKING ORDER AS WARRANTED ABOVE, YOUR SOLE REMEDY SHALL BE REPAIR OR REPLACEMENT AS PROVIDED ABOVE. IN NO EVENT WILL AW GEAR METERS BE LIABLE TO YOU FOR ANY DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS OR INCIDENTAL OR CONSEQUENTIAL DAMAGE ARISING OUT OF THE USE OR INABILITY TO USE SUCH PRODUCT, EVEN IF AW GEAR METERS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, OR FOR ANY CLAIM BY ANY OTHER PARTY.

THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

AW GEAR METERS

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www.awgearmeters.com

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